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European Patent Office
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(11) Publication number: **0 299 573 A1**

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number: 88201445.9

(22) Date of filing: 08.07.88

(51) Int. Cl.4: G11B 7/013 , G11B 7/26 , G11B 27/30

(30) Priority: 10.07.87 NL 8701632

(43) Date of publication of application: 18.01.89 Bulletin 89/03

(84) Designated Contracting States: DE ES FR GB NL

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(54) **System for recording and/or reading an information signal, record carrier and recording and/or read apparatus for use in such a system, and method of and apparatus for manufacturing such a record carrier.**

(57) An optically readable record carrier (1) is revealed, which is provided with a track 4 comprising an information area in which an information signal (Vi) is or can be recorded. A position-information signal (Vp) which is synchronous with a clock signal is recorded in the track 4 by means of a track modulation (Fig. 3) corresponding to the position-information signal (Vp). The position-information signal (Vp) indicates the track portion in which the information signal is recorded. An apparatus for recording and/or reading the record carrier (1) comprises an optical system (53) for scanning the information area in the track (4) by means of a radiation beam (55), an optical detector (57) for detecting the radiation beam (55) reflected by the record carrier (1) and for generating a detection signal (Vd) which is representative of the modulation of the detected radiation beam (55) caused by the track modulation, and a detection circuit (60) for extracting the position-information signal (Vp) from the detection signal (Vd). The track modulation corresponding to the position-information signal (Vp) is situated at the location of the information area in such a way that its frequency spectrum (31) is situated substantially outside the frequency range (Be) occupied by the frequency spectrum (30) of the information signal (Vi).

Further, an apparatus for manufacturing a record carrier (1) is described, in which a radiation-sensitive surface (85) is scanned by a radiation beam (87) in conformity with the desired track pattern. During scanning the radiation beam (87) is modulated in conformity with the position-information signal (Vp).

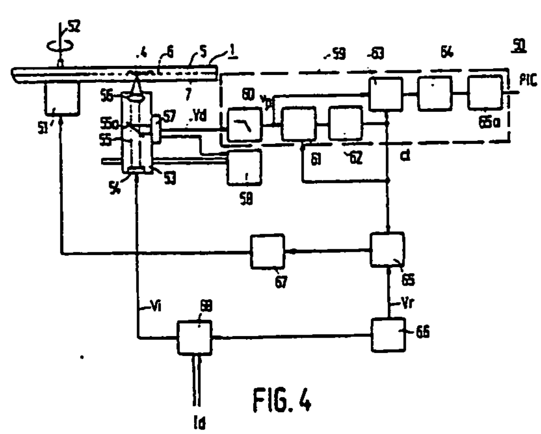

FIG. 4

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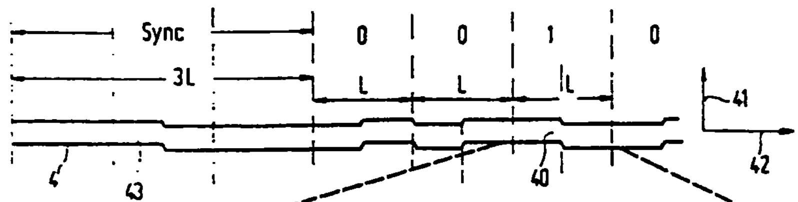

FIG.3a

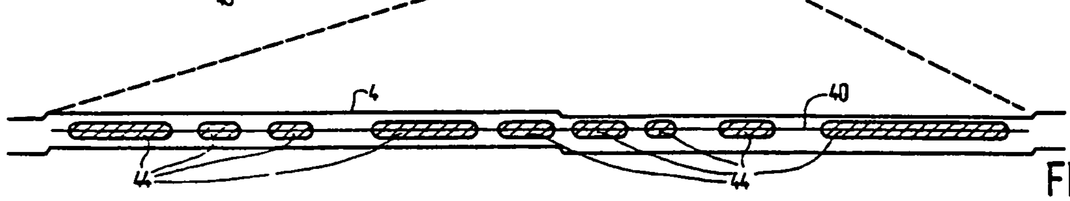

FIG.3b

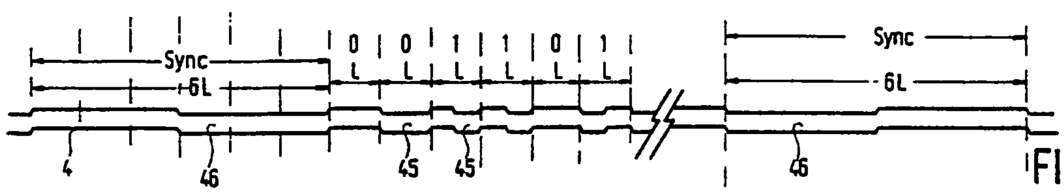

FIG.3c

System for recording and/or reading an information signal, record carrier and recording and/or read apparatus for use in such a system, and method of and apparatus for manufacturing such a record carrier.

The invention relates to a system for recording and/or reading an information signal, which system comprises an optically readable record carrier provided with a track containing an information area in which the information signal is recorded or can be recorded, in which track a position-information signal which is synchronous with a clock signal is recorded by means of a track modulation corresponding to the position-information signal, and an apparatus for recording and/or reading the information signal, which apparatus comprises an optical system for scanning the information area with a radiation beam, an optical detector for detecting the radiation beam reflected by the information area and for generating a detection signal which is representative of the modulation of the radiation beam caused by the track modulation, and a detection circuit for extracting the position-information signal from the detection signal.

The invention also relates to a record carrier and a recording and/or read apparatus for use in the system.

The invention further relates to a method and apparatus for manufacturing a record carrier for use in the system. A system as defined in the opening paragraph is described in the Applicant's British Patent Application GB 2,069,219 (PHN 9666).

The system described therein utilizes a record carrier in the form of an optically readable disc provided with a track formed by a spiral groove. The track comprises information areas which alternative with synchronization areas. The information areas are intended for recording information, whilst the synchronization areas provide control information for controlling the recording process by means of a preformed track modulation. This control information comprises inter alia position informat ion in the form of an address of an information area adjoining the synchronization area. If by means of the recording and/or read apparatus information is to be recorded in an information area having a specific address, the addresses of the synchronization areas are read by scanning the synchronization areas with the radiation beam. The information area where the information is to be recorded is located with the aid of the addresses thus read.

Although a specific track portion in which the information signal is to be recorded can be located by means of this known system the known system has the drawback that the information areas are each time interrupted by the synchronization areas.

This is a disadvantage, particularly if EFM-modulated information is to be recorded. For this recording method an uninterrupted information area is desirable.

It is an object of the invention to provide means which enable recording to be made in uninterrupted information areas and which during scanning of the record carrier enable the location of the part of the record carrier being scanned to be derived from the radiation beam reflected from the record carrier.

In accordance with the invention a system as defined in the opening paragraph is therefor characterized in that the track modulation corresponding to the position-information signal is situated at the location of the information area in such a way that the frequency spectrum of the position-information signal is situated substantially outside the frequency range occupied by the frequency spectrum of the information signal.

An embodiment of the system, which is characterized in that the detection circuit for extracting the position-information signal from the detection signal, comprises a filter having a pass hand which substantially corresponds to the frequency band occupied by the frequency spectrum of the position-information signal, enables the position information signal to be derived from the detection signal very simply.

During reading of the position-information signal control of the scanning velocity is desirable. To this end an embodiment of the system is characterized in that the recording and/or read apparatus comprises a clock-regeneration circuit for recovering the clock signal from the position-information signal and a control circuit for controlling the scanning velocity at a value for which the frequency of the clock signal is equal to the reference frequency, the frequency spectrum of the position-information signal being situated substantially outside the frequency band employed for velocity control. A type of modulation which is very suitable for the position-information signal and for which the frequency spectrum of the information signal exhibits substantially no frequency components in the low-frequency band utilized for velocity control is "biphase" modulation or "biphase-mark" modulation.

For recording the information signal various types of track modulations may be used. If, as is customary, the information to be recorded in the information areas is recorded in the form of recording marks having a reflectivity which differs from the surrounding area, a track modulation in the

form of a track undulation whose excursion relative to the track corresponds to the signal value of the position-information signal is very suitable. This yields a very satisfactory signal separation between the two information signals.

Embodiments of the invention and further advantages thereof will now be described in more detail, by way of example, with reference to Figures 1 to 11, of which

Figure 1 shows an embodiment of the record carrier in accordance with the invention

Figure 2 shows an example of a position-information code;

Figure 3 shows an example of the track modulation corresponding to the position-information signal;

Figure 4 shows a recording and/or read apparatus in accordance with the invention;

Figure 5 shows some signals occurring in the recording and/or read apparatus of Figure 4 as a function of time;

Figure 6 shows the frequency spectra of the information signal and the position-information signal, and the frequency band used for scanning-velocity control;

Figure 7 shows an example of the detector used in the recording and/or read apparatus of Figure 4;

Figure 8 shows an apparatus for manufacturing the record carrier in accordance with the invention;

Figure 9 shows an example of the position-information signal; and

Figure 10 and 11 shows another embodiment of the record carrier in accordance with the invention.

Figure 1 shows possible embodiments of a record carrier 1 for use in the system in accordance with the invention, Figure 1a being a plan view, Figure 1b showing a small part of a sectional view taken on the line b-b, and Figure 1c and Figure 1d being highly enlarged plan views of a part 2 of a first and a second embodiment of the record carrier 1. The information carrier 1 is provided with an information area constituted by a track 4 in the form of a preformed groove. The track 4 is intended for recording an information signal Vi. For the purpose of recording the record carrier 1 is provided with a recording layer 6 which is deposited on a substrate 5 nd which is covered with a radiation-transmitting protective coating 7. The recording layer 6 is of a material which, when exposed to suitable radiation, is subjected to an optically detectable change. Such a layer may comprise, for example, a thin metal layer such as tellurium. By means of laser radiation of sufficiently high intensity this metal layer can be melted locally, as a result of which this layer is locally given another reflection coefficient, so that when an information area thus formed is scanned by a radiation beam the reflected beam is amplitude-modulated in conformity with the recorded information. Alternatively, the layer 6 may consist of the radiation-sensitive materials as described, for example, in the book "Principles of Optical Disc Systems", Adam Hilgar Ltd., Bristol and Boston, pages 210-227.

The groove comprising the track 4 may be employed as a servo track, enabling a radiation beam projected on the record carrier to record the information to be accurately incident on the information area 4 constituted by the groove, i.e. enabling the position of the radiation beam in a radial direction to be controlled via a tracking system utilizing the light reflected from the record carrier 1. The measurement system for measuring the radial position of the radiation spot on the record carrier may correspond to one of the systems as described in the aforementioned book "Principles of Optical Disc Systems.

For determining the position of the radiation spot within the information area a position-information signal V_p is recorded in the information area 4 by means of a preformed track modulation, for example a track undulation as is shown in Figure 1c. However, other track modulations such as for example track-width modulation (Figure 1d) are also suited for this purpose. The position information represented by the position-information signal V_p may comprise a binary position-information code (PIC), for example in the form of a time code which indicates the time needed to cover the distance from the beginning of the track to the position where the position-information signal is located during scanning with the nominal scanning velocity. Such a time code may comprise, for example, a plurality of consecutive bits, as for example used in recording EFM-modulated information on CD and CD-ROM discs. Figure 2 shows a modification of the time code used in CD and CD-ROM, comprising a first portion 10 indicating the time in minutes, a second portion 11 indicating the time in seconds, a third portion 12 indicating a frame number, a fourth portion 12A indicating a sub-frame, and a fifth portion 13 comprising a plurality of correction bits.

Figure 3a is the plan view of a part of a track 4 which exhibits a track undulation corresponding to a "biphase" modulated position-information signal V_p. The track 4 comprises track portion 40 having a length L, each representing one bit of the position-information code (PIC). A bit of the logic value "1" is represented by a track portion 40 having a positive track excursion in a direction perpendicular to the track direction 42 over a first portion having a length 1/2 L followed by a second portion also

having a length 1/2 L and having a negative track excursion. A bit of the position-information code (PIC) of logic value "0" is represented by an opposite track undulation pattern, i.e. it comprises a first portion of a length 1/2 L with a negative track excursion, followed by a second portion of a length 1 2 L with a positive track excursion.

The track portion 40 which indicates the first bit of a position-information code is preceded by a synchronization track portion 43 with a track undulation of a shape which can be distinguished from the shape for the track undulation at the location of the track portions 40 representing the bits of the position-information code(PIC).

The synchronization track portion 43 shown in Figure 3a comprises a first portion having a length of 1 1/2 L with a positive track excursion, followed by a second portion also having a length of 1 1/2 L with a negative track excursion. Since in the track portions 40 the length of a track portion with a positive or negative track excursion is always equal to L or 2L, the beginning of each position-information code (PIC) is marked unambiguously by the synchronization track portion 43.

Figure 3c is a plan view of a part of the track 4 which exhibits a track undulation corresponding to a "biphase-mark" modulated position-information signal V_p. In such a modulation the track 4 is again divided into track portions 45 of a length L, each representing one bit of the position-information code (PIC). In this modulation the excursion at the location of the boundaries between the track portions 45 always exhibits a reversal of direction.

A bit of the the logic value "0" is represented by a track portion having an excursion whose direction does not change within the entire track portion 45. A bit of the logic value "1" is represented by a track portion in which the direction of the excursion is reversed. The time-information code is again preceded by a synchronisation track portion 46 which can be extinguished from the track portions 45 and which has a length which is six times the length L of the track portions 40, the direction of the excursion being reversed halfway the synchronization-track portion. Instead of the radial track modulations shown in Figures 3a and 3c the time code can be represented similarly by the track-width modulation shown in Figure 1d.

Figure 4 shows a recording and/or read apparatus 50 for recording and reading the record carrier 1. The apparatus 50 comprises a motor 51 for rotating the record carrier 1 about an axis 52. An optical write/read head 53 of a customary type is arranged opposite the record carrier 1. The write/read heat 53 comprises a radiation source in the form of a laser 54 for generating a radiation beam 55, and an objective 56 by means of which the radiation beam 55 can be focussed to form a tiny scanning spot on the recording layer 6.

The read/write head 53 can be operates in two modes, namely: a first mode (read mode) in which the laser 54 generates a radiation beam of constant intensity which is inadequate to produce the optically detectable change in the recording layer 6, and a second mode (recording mode) in which the radiation beam 53 is modulated in conformity with an information signal to be recorded in order to form a pattern of recording marks 44 having changed optical properties in conformity with the information signal Vi in the recording layer 6 at the location of the track 4 (see Figure 3b).

The beam which is reflected by the track 4 is passed to a radiation-sensitive detector 57 of a customary type via a semi-transparent mirror 55a. The detector 57 is constructed to generate a tracking-error signal which indi cates the position of the radiation spot relative to the track 4. The tracking-error signal is applied to a radial-position control circuit 58 which ensures that the radiation beam 55 remains on the track 4. Moreover, the detector 57 detects the intensity modulation caused by the track modulation in the radiation beam reflected by the record carrier 1. The detector 57 supplies a detection signal Vd corresponding to the detected intensity modulation.

The position-information code (PIC) represented by the preformed track modulation is recovered from the detection signal Vd by a detection device 59. For this purpose the detection circuit 59 comprises a band-pass filter 60 which is adjusted in such a way that when the track 4 is scanned with the nominal scanning velocity it almost exclusively transmits the position-information signal Vp (see Figure 5) corresponding to the preformed track modulation. By means of a customary phase-locked loop circuit, comprising a phase detector 61 and a voltage-controlled oscillator 62, a clock signal c1 (see Figure 5) which is in synchronism with the position-information signal Vp is derived from the position-information signal Vp.

By means of a sampling circuit 63 which is controlled by the clock signal and a comparator circuit 64 the position-information signal Vp is converted into a binary signal Vp′ (see Fig. 5), from which the individual bits of the position-information codes (PIC) are recovered by means of a "biphase" demodulator 65A of a customary type.

The frequency of the clock signal cl is proportional to the velocity with which the track 4 is scanned, so that this clock signal cl can be used as a measurement signal for the purpose of controlling the scanning velocity. In the embodiment shown, this velocity control is achieved in that a phase detector 65 compares the phase of the clock signals cl with the phase of a periodic reference signal Vr of constant frequency fr which is generated by

an oscillator 66. By means of a control circuit 67 the speed of the motor 51 is controlled at a value for which the phase difference determined by the phase detector 65 remains substantially zero, so that the scanning velocity of the disk is maintained constant at a value dictated by the frequency fr. If by means of the read/write apparatus 50 an information signal Vi is to be recorded in a portion of the track 4 defined by a selected position-information code, the desired track portion can be located prior to recording by means of the position-information codes (PIC) read in the read mode. As soon as the desired track portion has been located, the read/write head 53 can be operated in the write mode, the radiation beam 55 then being modulated in conformity with the information signal Vi to be recorded.

Figure 3b, by way of example, shows a pattern of recording marks 44 with modified optical properties, arising during recording of, for example, information signal Vi which is an EFM-modulated in conformity with the CD standard. The frequency spectrum of such an EFM-modulated information signal is indicated by the reference numeral 30 in Figure 6. As is apparent from Figure 6, the EFM-modulated information signal Vi does not exhibit any strong frequency components below 100 KHz.

The track modulation representing the position-information signal Vp is dimensioned in such a way that the frequency spectrum for the position-information signal Vp read at the nominal scanning velocity does not exhibit any strong frequency components in the frequency range Be occupied by the position-information signal Vi. The frequency spectrum of the position-information signal Vp bears the reference numeral 31 in Figure 6. If the position-information signal is "biphase" or "biphase-mark" modulated as in the embodiments described above, the frequency spectrum of the position-information signal Vp does not exhibit any strong frequency components situated within the frequency band Br used for scanning velocity control (indicated by the reference numeral 32).

If the frequency spectra 30 and 31 do not overlap, as is indicated in Figure 6, the position-information signal Vp and the information signal Vi can always be read simultaneously without any significant interaction, so that it is also possible to read the position-information codes (CIP) during recording of the information signal or during reading of a signal already-recorded. Moreover, as the frequency spectrum 31 exhibits substantially no frequency components within the frequency band Br, scanning-velocity control is not influenced by the position-information signal Vp. If the recorded signal is an EFM modulated signal in conformity with the CD-standard, a position-information signal which is in synchronism with a 22.05kHz or 44.1-kHz clock signal is very suitable.

Since for such an EFM modulation the repetition frequency of the data words is 44.1 kHz, the recording apparatus must comprise a 44.1 kHz frequency source, so that the reference signal Vr for scanning-velocity control may be derived from this frequency source, which is available any-way. The frequency spectrum 31 in Figure 6 corresponds to the spectrum of a signal which is "biphase" modulated with a clock frequency of 44.1 kHz.

In the embodiment of the record carrier described in the foregoing the preformed track modulation corresponds to a "biphase" or a "biphase-mark" modulated position-information signal Vp. However, it will be evident that, in principle, any track modulation is suitable, which corresponds to a position-information signal Vp having a frequency spectrum which does not overlap the frequency spectrum of the information signal Vi. If a measurement signal for scanning-velocity control is derived from the position-information signal Vp, it is moreover required that the frequency spectrum of the position-information signal does not comprise any strong frequency components within the frequency band used for scanning-velocity control.

When a track modulation in the form of a track undulation is employed a very satisfactory signal separation between the information signal Vi and the position-information signal Vp during read-out can be obtained by means of the optical detector 57 shown in Figure 7. The detector 57 comprises a photodetector 70 which is divided in two parts a and b along an axial line. A differential amplifier 71 supplies a difference signal representing the difference between the amounts of radiation of the modulated beam 55 detected by the parts a and b. A summing amplifier 72 supplies a sum signal, which is representative of the sum of the amounts of radiation detected by the parts a and b.

Generally, the bandwidth of the tracking control is too small to enable the track undulation to be followed. In that case the track 4 will be scanned in such a way that the centre of the scanning beam 55 follows a path 73 which is respresentative of the average position of the centre of the track 4. The modulation of the radiation beam produced by the track undulation will be represented strongly in the signal on the output of the differential amplifier 71, whilst the modulation caused by the recorded information signal will be represented in particular in the signal on the output of the summing amplifier. A filter 74 rejects the frequency components situated outside the frequency range occupied by the information signal, so that the signal Vi on the output of the filter 74 almost exclusively comprises the frequency components of the information signal Vi.

Similarly, the filter 60 removes undesired frequency components from the information signal Vp. The position-information signal Vp is very suitable for locating the track portion desired for recording the information signal. However, said signal is also useful for detecting undesired track jumps, for example as a result of mechanical vibrations. A track jump can then be detected by means of the position-information codes (PIC) read consecutively. If two consecutive position-information codes (PIC) do not adjoin each other, this means that a track jump has occurred. The above method of recording position-information codes enables a very fast detection of undesired track jumps to be effected, because the number of position-information codes recorded per unit of time is very high in comparison with the number of time codes recorded per unit of time in CD or CD-ROM system.

Figure 8 shows an embodiment of an apparatus for manufacturing a record carrier in accordance with the invention. The apparatus 81 comprises a turntable 82 which can be rotated by a drive means 83. A disc-shaped carrier 84, for example a flat glass disc provided with a light-sensitive layer 85, for example in the form of a photoresist, can be placed on the turntable 82.

A laser 86 generates a light beam 87 which is projected onto the light-sensitive layer 85. The light beam 87 is first passed through a deflection device 90. The deflection device 90 is of a type by means of which a light beam can be deflected vary accurately within a small range. The deflection device may be, for example, a mirror which can be pivoted through a small angle, an electro-optical deflection device or an acousto-optical deflection device. In Figure 8 the limits of the deflection range are indicated in broken lines. The light beam 87 deflected by the deflection device 90 is passed to an optical head 96. The optical head 96 comprises a mirror 97 and an objective 98 for focusing the light beam onto the light-sensitive layer 85. The optical head 96 is movable in a radial direction relative to the rotating carrier 84 by means of an actuating device 99.

By means of the optical system described herein the light beam 87 is focused to form a scanning spot 100 on the light-sensitive layer 85, the position of said scaning spot 100 being dependent on the magnitude of the deflection of the light beam 87 produced by the deflection device 90 and the radial position of the write head 96 relative to the carrier 84. In the shown position of the optical head 16 the scanning spot 100 can be moved within a range B1 by means of the deflection device 90. By moving the optical head 96 the target point can be moved within a range B2 by means of the deflection device shown.

A control device 101, for example a computer system, enables the speed of the drive means 83 and the radial velocity of the actuating device 99 to be controlled in a customary manner, in such a way that the light-sensitive layer 85 is scanned by the radiation beam 87 with a constant scanning velocity in accordance with a spiral path. Such controlling system is described in detail in the Dutch patent application nr. 8701448 (PHN 12 163) The control circuit 101 further generates the position-information signal Vp. The position-information signal Vp comprises a signal (see Fig. 9) which is in synchronism with a clock signal, i.e. the spacing between the zero crossing of the position-information are equal to a predetermined time interval T/2 or a multiple thereof.

The waveform of the position-information signal Vp is selected in such a way that the frequency spectrum of the position-information signal does not exhibit any strong frequency components situated within the frequency range intended for recording the information signal Vi.

The position-information signal Vp represents the position information, which comprises for example a time code as shown in Figure 2, which continually indicates the time which has expired since scanning has started.

The position-information signal Vp shown in Figure 9 exhibits a "biphase" modulation. Here the position-information code (PIC) is converted into a synchronous signal which is positive for the time interval T/2 and negative for the next time interval T/2 for a logic "1" of the position -information code (PIC). A ligic "0" yields exactly the opposite binary signal, i.e. negative for the time interval T/2 and positive for the next time interval T/2.

As already stated, a "biphase" modulated signal has the advantage that it does not exhibit any strong frequency components in the low-frequency range, so that the position-information signal Vp may be utilized for velocity control of the record carrier 1. The position-information signal Vp is used to control the deflection device 90, so that the scanning point 100 will perform a radial undulation relative to the path defined by the position of the optical head 96, the instantaneous radial excursion corresponding to the instantaneous signal value of the position-information signal Vp.

After the light-sensitive layer 85 has been scanned in the manner described above it is subjected to an etching process, the parts of the layer 85 which have been exposed to the radiation beam 87 being removed, yielding a master disc formed with a groove which exhibits a radial undulation corresponding to the information signal Vp. Subsequently, replicas are made of this master disc and are provided with the recording layer 6. The record carrier thus obtained has a track in the form of a groove. When the information signal Vi is recorded

the information are in the groove is provided with a pattern of recording masks corresponding to the information signal Vi. However, in practice it has been found that a better signal-to-noise ratio is obtained if the information signal is recorded in a track formed by a ridge instead of a groove. Such a record carrier 110 is shown in Figures 10a and 10b. The tracks in the form of ridges 111 are shown only diagrammatically in Figure 10a and they are shown to a strongly enlarged scale in an area 112 in Figure 10b. Figure 11 is a sectional view taken on the line XI-XI within the area 112 of the record carrier 110, which comprises a substrate 113, a recording layer 114, and a transparent coating 115.

As in the record carrier 110 the diameter of the grooves 116 situated between the ridges 111 is not constant as a result of the radial undulation of the ridges 11, the method of manufacturing differs from the method of manufacturing record carriers having a track pattern comprising grooves of constant with, as described with reference to Figure 8.

A track pattern of ridges of constant width can be obtained by means of a method which bears much resemblance to the method described with reference to Figure 8. However, in this case the light-sensitive layer 114 must consist of a negative photoresist instead of a positive photoresist. During development of a later consisting of such a negative photoresist the non-exposed portions of the photoresist are removed instead of the exposed portions as in the case of the customary positive photoresist, after which a master disc with the desired track pattern of ridges is obtained, of which subsequently replicas can be made in the customary manner.

The record carrier with a track pattern of ridges of constant width can also be obtained starting from a substrate 84 with a light-sensitive layer 85 consisting of the customary positive photoresist, from which the exposed portions are removed during development. In that case the carrier 84 is provided with a track pattern of grooves of constant width which is the complement of the desired track pattern of constant-width ridges. The winding sense of such a complementary track pattern of grooves is opposed to that of the desired track pattern. This means that for obtaining the carrier with an opposite track pattern only the direction of rotation of the carrier 84 during scanning must be opposite to the direction of rotation desired during reading of the record carrier 110. The process of scanning the carrier 84 can be controlled in the same way as decribed with reference to Figure 8.

Claims

1. A system for recording and/or reading an information signal, which system comprises an optically readable record carrier provided with a track containing an information area in which the information signal is recorded or can be recorded, in which track a position-information signal which is synchronous with a clock signal is recorded by means of a track modulation corresponding to the position-information signal, and an apparatus for recording and/or reading the information signal, which apparatus comprises an optical system for scanning the information area with a radiation beam, an optical detector for detecting the radiation beam reflected by the information area and for generating a detection signal which is representative of the modulation of the radiation beam caused by the track modulation, and a detection circuit for extracting the position-information signal from the detection signal, characterized in that the track modulation corresponding to the position-information signal is situated at the location of the information area in such way that the frequency spectrum of the position-information signal is situated substantially outside the frequency range occupied by the frequency spectrum of the information signal.

2. A system as claimed in Claim 1, characterized in that for the purpose of extracting the position-information signal from the detection signal the detection circuit comprises a filter having a pass band which substantially corresponds to the frequency band occupied by the frequency spectrum of the position-information signal.

3. A system as claimed in Claim 1 or 2, characterized in that the recording and/or read apparatus comprises a clock-regeneration circuit for recovering the clock signal from the position-information signal and a control circuit for controlling the scanning velocity at a value for which the frequency of the clock signal is equal to a reference frequency, the frequency spectrum of the position-information signal being situated substantially outside the frequency band employed for velocity control.

4. A system as claimed in any one of the preceding Claims, characterized in that the position-information signal exhibits a biphase modulation.

5. A system as claimed in any one of the Claims 1 to 3, characterized in that the position-information signal exhibits a biphase mark modulation.

6. A system as claimed in any one of the preceding Claims, characterized in that the track modulation is formed by a track undulation, the track excursion corresponding to the signal value of the position-information signal.

7. A recording and/or read apparatus for use in the system as claimed in any one of the Claims 1, 2 or 3.

8. A record carrier for use in the system as claimed in any one of the CLaims 1, 3, 4, 5 or 6.

9. A method of manufacturing a record carrier as claimed in Claim 8, a radiation-sensitive area being scanned by a radiation beam in accordance with a path corresponding to the desired track pattern, the radiation beam being modulated during scanning with a position-information signal which is in synchronism with a clock signal, the position-information signal indicating the instantaneous scanning position, characterized in that the frequency spectrum of the position -information signal is situated substantially outside the frequency range intended for recording the information signal.

10. A method as claimed in Claim 9, characterized in that the amplitudes of the frequency components of the position-information signal are substantially zero for fequencies below a predetermined frequency range.

11. A method as claimed in Claim 10, characterized in that the position-information signal exhibits a biphase modulation.

12. A method as claimed in Claim 11, characterized in that the position-information signal exhibits a biphase-mark modulation.

13. A method as claimed in any one of the Claims 9, 10, 11 or 12, characterized in that for the purpose of modulating the radiation beam the beam is deflected in a direction perpendicular to the scanning direction over a distance which corresponds to the signal strength of the position-information signal.

14. A device for carrying out a method as claimed in any one of the Claims 9, 10, 11, 12 or 13, comprising an optical system for scanning a radiation-sensitive surface with a radiation beam in conformity with the desired track pattern, means for generating a position-information signal which is in synchronism with a clock signal and which indicates the instantaneous scanning position, and means for modulating the radiation beam in conformity with the position-information signal during scanning, characterized in that the signal-generating means are adapted to generate a position-information signal having a frequency spectrum which is situated substantially outside the frequency range intended for recording the information signal.

15. An apparatus as claimed in Claim 14, characterized in that the signal-generating means are adapted to generate a position-information signal whose frequency components below a predetermined frequency are a substantially zero.

16. An apparatus as claimed in Claim 15, characterized in that the signal-generating means are adapted to generate a biphase-modulated position-information signal.

17. An apparatus as claimed in Claim 15, characterized in that the signal-generating means are adapted to generate a biphase-mark modulated position-information signal.

18. An apparatus as claimed in any one of the Claims 14, 15, 16 or 17, characterized in that the apparatus comprises a deflection device for deflecting the scanning beam under control of the position-information signal in a direction perpendicular to the scanning direction over a distance corresponding to the strength of the position-information signal.

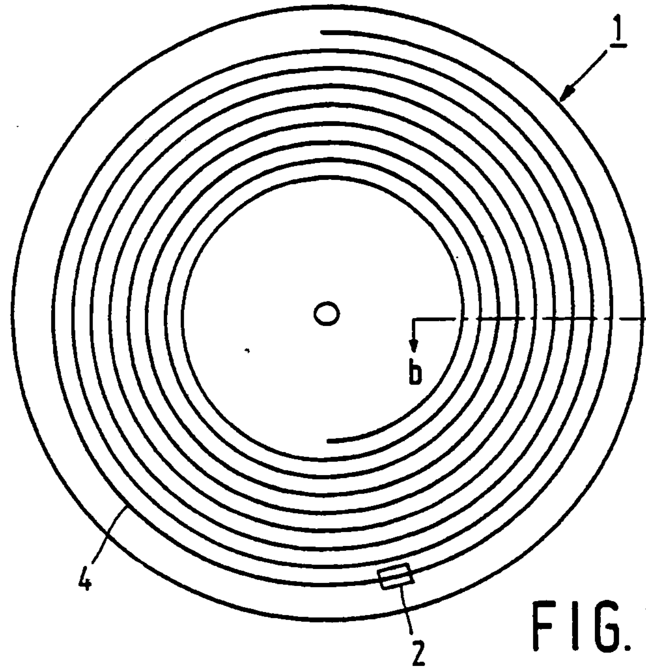

FIG. 1a

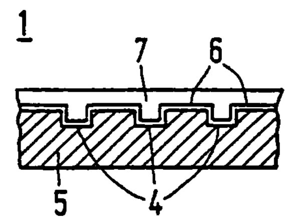

FIG.1b

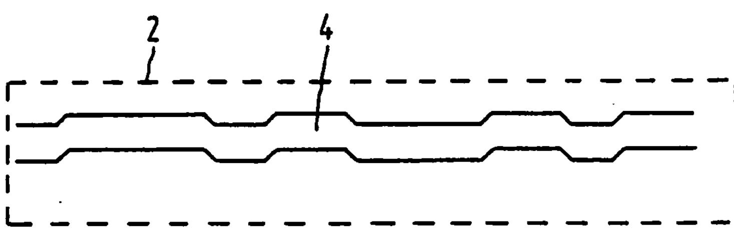

FIG.1c

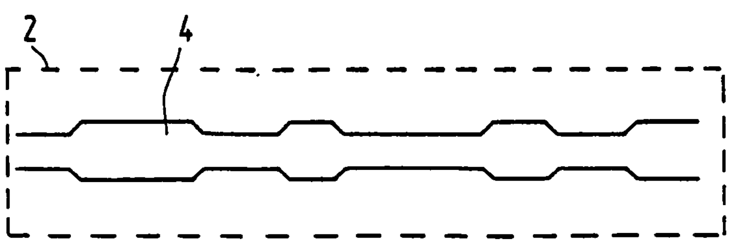

FIG.1d

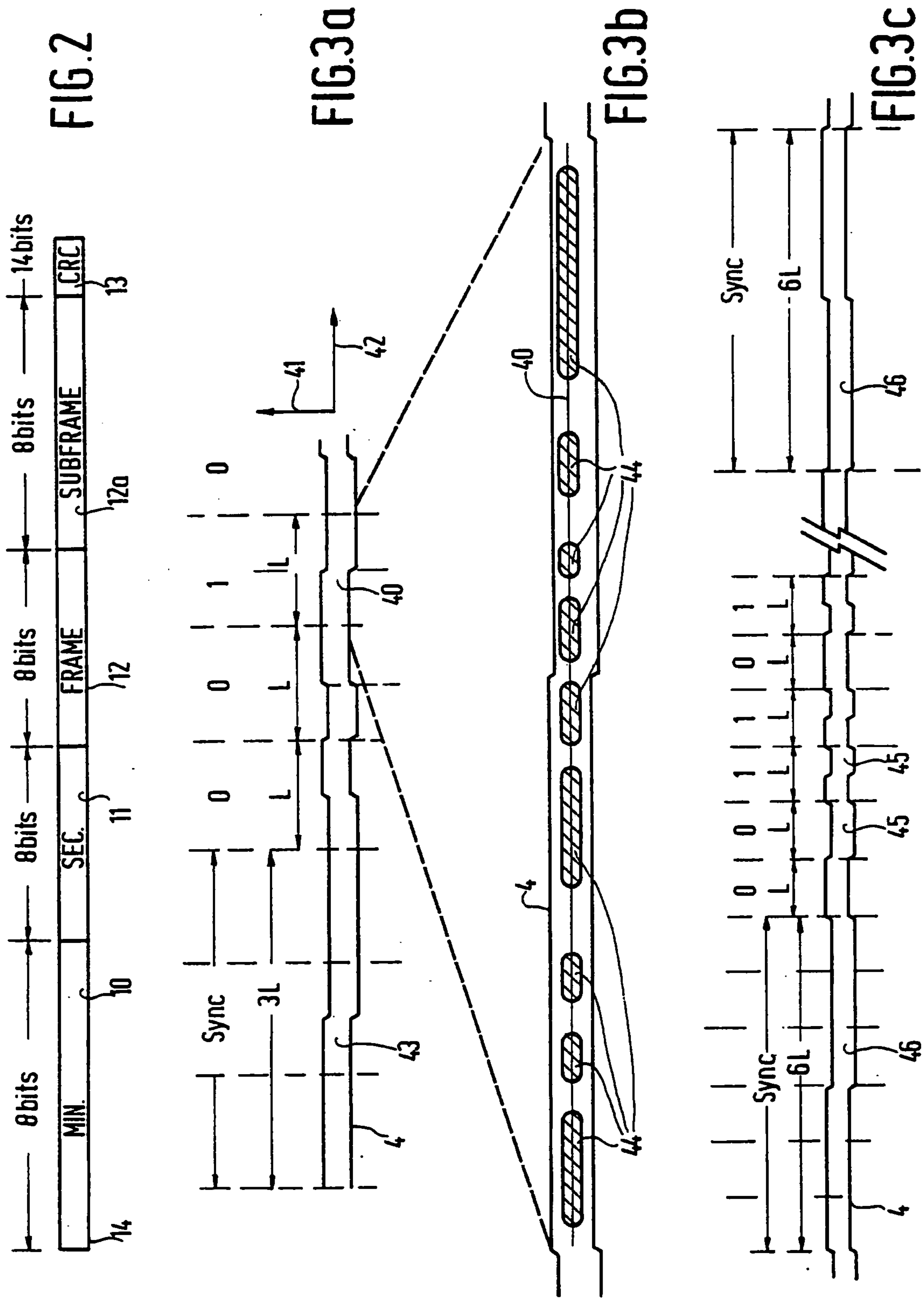

FIG.2

FIG.3a

FIG.3b

FIG.3c

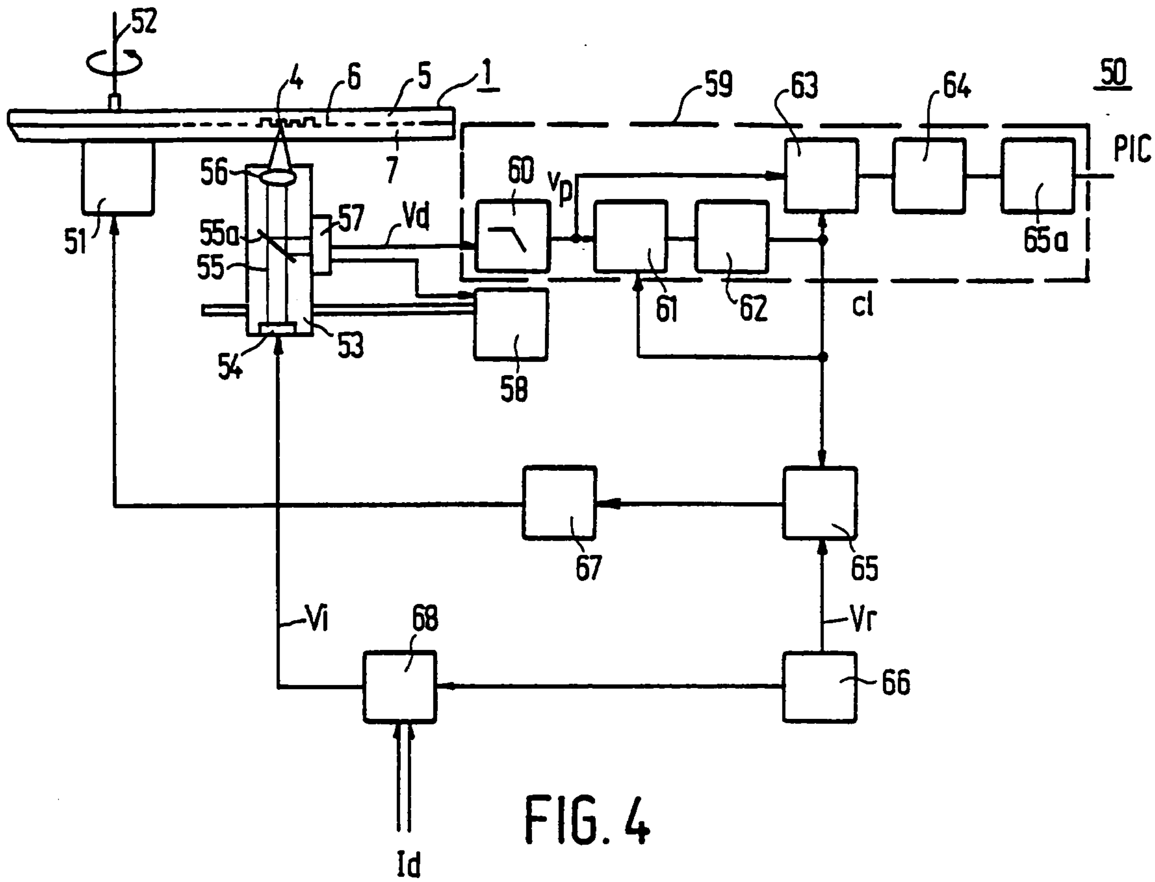
52
4
6
5
1
50
59
63
64
PIC
56
60
Vp
57
Vd
55a
55
51
61
62
65a
cl
54
53
58
67
65
Vi
68
Vr
66
Id

FIG. 4

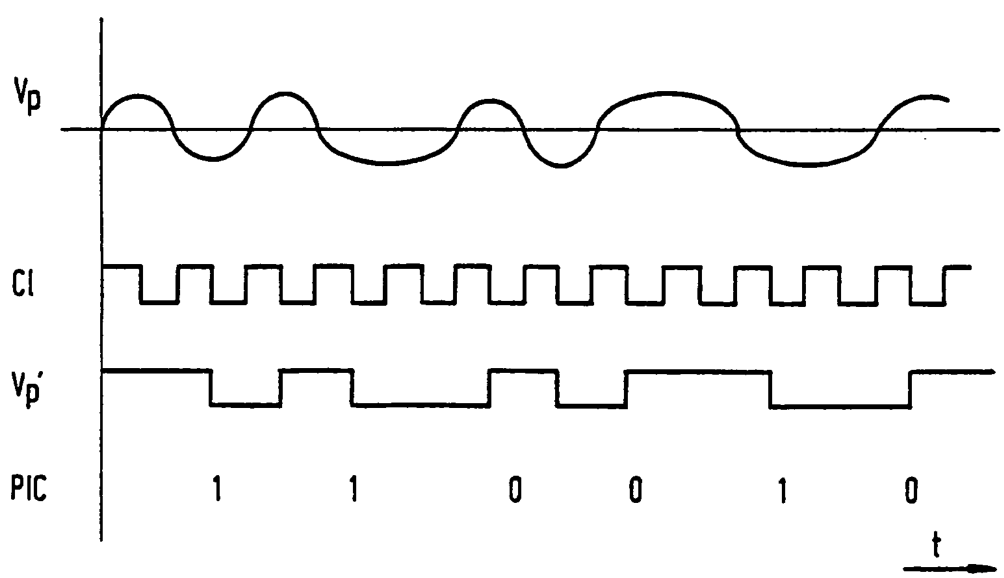
Vp
Cl
Vp'
PIC
1
1
0
0
1
0
t

FIG. 5

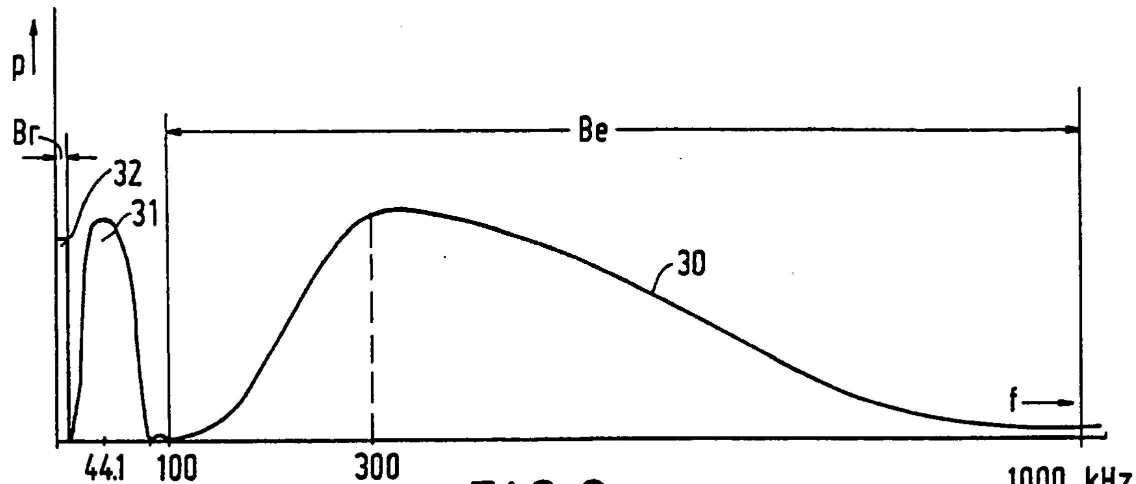

FIG.6

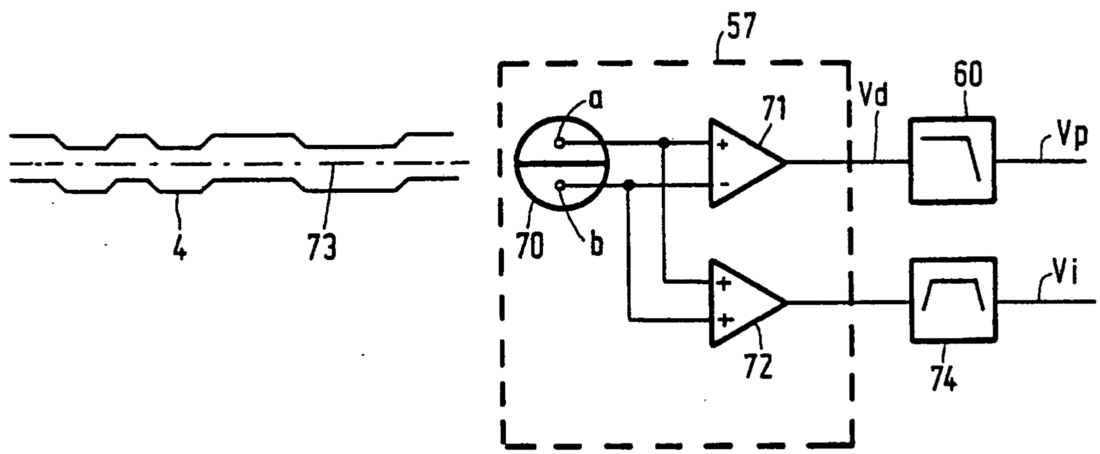

FIG.7

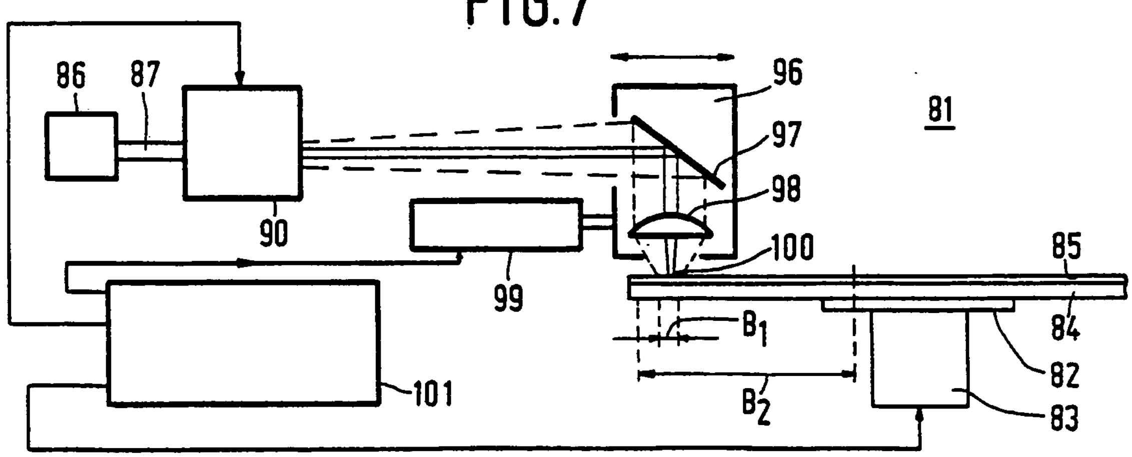

FIG.8

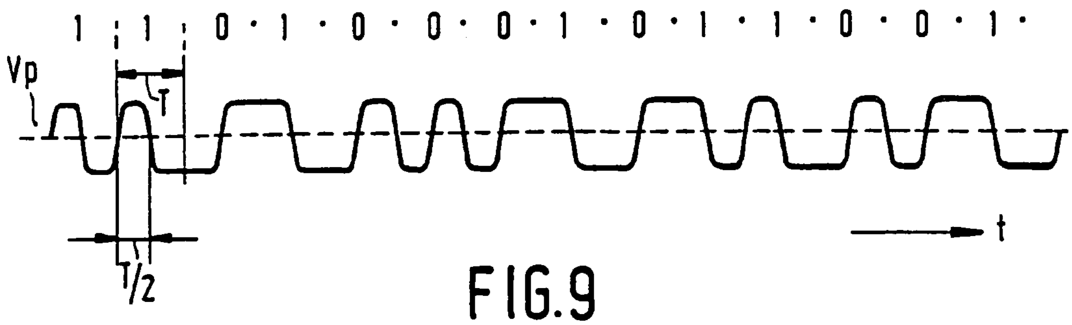

FIG.9

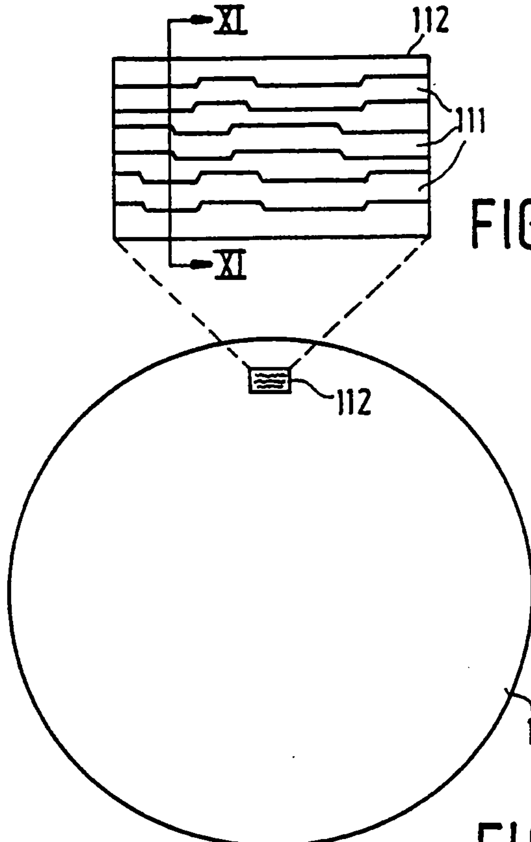

FIG.10b

FIG.10a

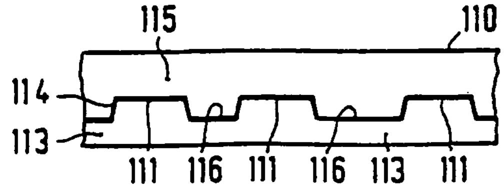

FIG.11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 20 1445

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,Y	GB-A-2 069 219 (N.V. PHILIPS' GLOEILAMPENFABRIEKEN) * Whole document *	1-4,6-11,13,14,18	G 11 B 7/013 G 11 B 7/26 G 11 B 27/30
Y	PATENT ABSTRACTS OF JAPAN, vol. 6, no. 252 (P-161)[1130], December 1982, page 10 P 161; & JP-A-57 147 139 (MATSUSHITA DENKI SANGYO K.K.) 10-09-1982 * Abstract; figures *	1,2,7-9,14	
Y	EP-A-0 166 199 (VICTOR CO. OF JAPAN LTD) * Page 2, line 7 - page 3, line 11; page 4, line 4 - page 8, line 13; claims *	2,7-9,14	
Y	JP-A-62 043 839 (SONY CORP.) & PATENT ABSTRACTS OF JAPAN, vol. 11, no. 230 (P-599)[2677], 28th July 1987, abstract	2,6-9,13,14,18	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
Y	GB-A-2 064 260 (N.V. PHILIPS' GLOEILAMPENFABRIEKEN) * Page 5, lines 102-113 *	4,11	G 11 B
A	PATENT ABSTRACTS OF JAPAN, vol. 8, no. 92 (P-271)[1529], 27th April 1984; & JP-A-59 5449 (MATSUSHITA DENKI SANGYO K.K.) 12-01-1984 * Abstract *	1,6,8,9	
A	EP-A-0 164 131 (VICTOR COMPANY OF JAPAN LTD) * Whole document *	1,3,7-9,14	

-/-

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14-10-1988	DAALMANS F.J.

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Application Number

EP 88 20 1445

DOCUMENTS CONSIDERED TO BE RELEVANT

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A	DE-A-3 620 331 (OLYMPUS OPTICAL CO. LTD) * Whole document * ---	1;7-10	
A	EP-A-0 145 789 (MATSUSHITA ELECTRIC INDUSTRIAL) * Whole document * -----	1,3,7-9,14	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)

The present search report has been drawn up for all claims

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